

1. Solve the simultaneous equations

$$x + y = 2$$

$$4y^2 - x^2 = 11$$

(Total 7 marks)

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2. Solve the simultaneous equations

$$y + 4x + 1 = 0$$

$$y^2 + 5x^2 + 2x = 0$$

(Total 6 marks)

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3. Solve the simultaneous equations

$$y - 2x - 4 = 0$$

$$4x^2 + y^2 + 20x = 0$$

(Total 7 marks)

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4. Given the simultaneous equations

$$2x + y = 1$$

$$x^2 - 4ky + 5k = 0$$

where  $k$  is a non zero constant,

- (a) show that  $x^2 + 8kx + k = 0$ .

(2)

Given that  $x^2 + 8kx + k = 0$  has equal roots,

- (b) find the value of  $k$ .

(3)

- (c) For this value of  $k$ , find the solution of the simultaneous equations.

(3)

(Total 8 marks)

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11. The straight line with equation  $y = 3x - 7$  does not cross or touch the curve with equation  $y = 2px^2 - 6px + 4p$ , where  $p$  is a constant.

- (a) Show that  $4p^2 - 20p + 9 < 0$ .

(4)

- (b) Hence find the set of possible values of  $p$ .

(4)

(Total 8 marks)

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Question	Scheme		Marks
1	<p>Either</p> $y^2 = 4 - 4x + x^2$ $4(4 - 4x + x^2) - x^2 = 11$ <p>or <math>4(2 - x)^2 - x^2 = 11</math></p> $3x^2 - 16x + 5 = 0$ $(3x - 1)(x - 5) = 0, \quad x = \dots$ $x = \frac{1}{3} \quad x = 5$ $y = \frac{5}{3} \quad y = -3$	<p>Or</p> $x^2 = 4 - 4y + y^2$ $4y^2 - (4 - 4y + y^2) = 11$ <p>or <math>4y^2 - (2 - y)^2 = 11</math></p> $3y^2 + 4y - 15 = 0$ <p>Correct 3 terms</p> $(3y - 5)(y + 3) = 0, \quad y = \dots$ $y = \frac{5}{3} \quad y = -3$ $x = \frac{1}{3} \quad x = 5$	<p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1A1</p>
			(7 marks)
2	<p><math>y = 2x + 4 \Rightarrow 4x^2 + (2x + 4)^2 + 20x = 0</math></p> <p>or</p> $2x = y - 4 \text{ or } x = \frac{y - 4}{2}$ $\Rightarrow (y - 4)^2 + y^2 + 10(y - 4) = 0$ $8x^2 + 36x + 16 = 0$ <p>or</p> $2y^2 + 2y - 24 = 0$ $(4)(2x + 1)(x + 4) = 0 \Rightarrow x = \dots$ <p>or</p> $(2)(y + 4)(y - 3) = 0 \Rightarrow y = \dots$ $x = -0.5, x = -4$ <p>or</p> $y = -4, y = 3$ <p>Sub into <math>y = 2x + 4</math></p> <p>or</p> $x = \frac{y - 4}{2}$ <p>Sub into</p> $y = 3, y = -4$ <p>and</p> $x = -4, x = -0.5$		<p>M1</p> <p>M1 A1</p> <p>M1</p> <p>A1 cso</p> <p>M1</p> <p>A1</p>
			(7 marks)

<b>3</b>	$y = -4x - 1$ $\Rightarrow (-4x - 1)^2 + 5x^2 + 2x = 0$ $21x^2 + 10x + 1 = 0$ $(7x+1)(3x+1) = 0 \Rightarrow (x =) -\frac{1}{7}, -\frac{1}{3}$ $y = -\frac{3}{7}, -\frac{1}{3}$	M1  A1 dM1 A1  M1 A1
		<b>(6 marks)</b>
<b>4(a)</b>	$x^2 - 4k(1 - 2x) + 5k (= 0)$ So $x^2 + 8kx + k = 0^*$	M1 A1cso
		<b>(2)</b>
<b>4(b)</b>	$(8k)^2 - 4k$ $k = \frac{1}{16} \text{ (oe)}$	M1A1  A1
		<b>(3)</b>
<b>4(c)</b>	$x^2 + \frac{1}{2}x + \frac{1}{16} = 0$ so $(x + \frac{1}{4})^2 = 0 \Rightarrow x =$ $x = -\frac{1}{4}, y = 1\frac{1}{2}$	M1  A1A1
		<b>(3)</b>
		<b>(8 marks)</b>
<b>11(a)</b>	$2px^2 - 6px + 4p = 3x - 7$ or $y = 2p\left(\frac{y+7}{3}\right)^2 - 6p\left(\frac{y+7}{3}\right) + 4p$ <b>Examples</b> $2px^2 - 6px + 4p - 3x + 7 (= 0), \quad -2px^2 + 6px - 4p + 3x - 7 (= 0)$ $2p\left(\frac{y+7}{3}\right)^2 - 6p\left(\frac{y+7}{3}\right) + 4p - y (= 0), \quad 2py^2 + (10p - 9)y + 8p (= 0)$ $y = 2px^2 - 6px + 4p - 3x + 7$ E.g. $b^2 - 4ac = (-6p - 3)^2 - 4(2p)(4p + 7), \quad b^2 - 4ac = (10p - 9)^2 - 4(2p)(8p)$ $4p^2 - 20p + 9 < 0^*$	M1     dM1   ddM1 A1*
		<b>(4)</b>
<b>11(b)</b>	$(2p - 9)(2p - 1) = 0 \Rightarrow p = \dots$ to obtain $p =$ $p = \frac{9}{2}, \frac{1}{2}$ $\frac{1}{2} < p < 4\frac{1}{2}$	M1  A1  M1 A1
		<b>(4)</b>
		<b>(8 marks)</b>

